THE RELATIONSHIP OF DISRUPTIONS AMONG CHICKENS IN SOCIAL BEHAVIOR AND EGG PRODUCTION

by

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INTRODUCTION

The social life of chickens has interested biologists for many years. Much of what is known today came during the last twenty years from the laboratories of Prof. W. C. Allee and his associates, and Dr. A. M. Guhl, of Kansas State College.

Fowls have characteristic ways of behaving which must be considered when working with them, either experimentally or on the poultry farm. Flocks of hens are organized, and man's manipulations or interferences with their social system may cause repercussions that will be reflected in the progress of their development or in the egg production of the flock, which is the primary concern of the commercial poultryman.

Events occurring during and subsequent to the assemblage of a flock are of particular significance, since at the stage of peck-order formation the individuals form habits which may persist for many weeks, or even months.

From a practical standpoint it seems reasonable to conclude that a manager of flocks should keep these groups as stable as possible, so as to keep the tension of the group at a minimum. This will also result in less interference during feeding and other activities that occur in the pen. Experiments have demonstrated that when strange hens are introduced into an organized group, the tension and social activity increase until the social position of the new individual is determined.

The practice of combining flocks subsequent to culling

presents problems that merit consideration. If birds must be shifted, the number of birds introduced should be approximately equal to the number in the pen. The greater the deviation from this ratio, the more serious the social stress placed on the outnumbered individuals. Recent experimental evidence has shown that additional sources of food and water would be helpful until it becomes evident that the birds intermingle quite freely.

Chickens can and do make adjustments to changing situations; however, alteration of habits requires time, and the effects produced in the interim may be costly to the producer as well as to the research worker.

This experiment was set up to study some of the effects of social disruptions on egg production.

REVIEW OF LITERATURE

Sanctuary (1932) made a study of dominance orders among chickens. He observed that a certain percentage of fully mature White Leghorn pullets would go out of laying condition within a week or two after being placed in their winter quarters. These birds were seen to spend much of their time on the top of some window fixture and on the roosts during the daytime. Several of these birds went into a neck molt. The cause for this was at first thought to be a lack in the ration or some fault in management.

The first clue to a correct explanation came through an incident. Four birds were placed in a show coop; one was removed.

Upon returning to replace this bird with the others, it was observed that a second bird had become a domineering boss of the remaining two, for each was in a separate corner trying to protect itself from the pecks of the boss bird. Bird number one was then placed in the coop. She gave the domineering bird that was in the cage one peck. The other birds again took interest in life and all was peaceful in the coop once more, for bird number one was a lenient boss. At once a hypothesis was formulated in explanation of what was observed. Three other observations during the next two years confirmed the order of dominance theory.

Much of the basic information on the social order of chickens was initially reported by Schjelderup-Ebbe. Although his accounts were marked with anthropomorphisms, his conclusions have been confirmed by others. In one of his many articles (1935), he described the effects produced when strange hens were added to a confined group which had developed a social order.

Schjelderup-Ebbe (1935) based the avian hierarchy on what he called peckrights, in which the relative position of each hen is determined by the number of birds it pecks. The truly dominant bird pecks all in its flock without being pecked in return, and the bottom bird is pecked by all. The pecks are usually delivered on the head, as an attack on the individual. The intensity of such blows varies from hard pecks, which may draw blood, to those which are undelivered and constitute a threat to peck or bluffing. Sometimes sounds of a threatening nature are sufficient to cause a hen to give way to an aggressive flockmate.

A definite social pattern among hens is revealed when careful tabulations are made of individuals in these attacks (Schjelderup-Ebbe, 1935). In small flocks the boss hen usually pecked all in her flock without being pecked in return. Another hen pecked none and was pecked by all the others in the pen. Between these extremes the remainder can be ranked in an order in accordance with the number of birds each pecks. The hen doing the pecking is dominant over, or superior to, the subordinate or inferior one which she pecks. Among poultrymen the behavior is called "bossism". In very small flocks the hens may be ranked in straight-line order of dominance, but pecking "triangles" may occur in some flocks. For example, the number five hen may peck the number six; six may peck seven, which in turn may peck five. Such triangles are common in large flocks and may be found at any level in the peck order. A given ranking may persist unchanged for months in small flocks.

Fischel (1927) made a distinction between open and closed orders upon the basis of the size of the flock. In flocks of five hundred birds, it is possible in so large a flock that birds could enter it without going through the formal introduction process such as is necessary when a bird enters a closed order (small) flock. The basis for this may well be the limits of the capacity of the individual birds to remember so many other birds.

Collias (1943, 1944) observed that when strange birds were brought together for the first time, fights occurred between the individuals until a decision was reached, but not infrequently

some submitted passively. Upon the outcome of these initial pair-contacts the social order was based, as a defeated bird avoids the hens to whom she lost in the introductory contest.

Since hens avoid certain individuals and peck others with regularity, it is obvious that hens can recognize each other. The birds recognized their penmates by features of the head, such as the comb (Allee, et al., 1939).

A separation of one, two, or three days made no difference for full-grown birds (when both are full grown); they recognized each other again as human beings do (Schjelderup-Ebbe, 1935). Four or six days, however, may make a noticeable difference and we soon come to a critical point. Separation of a little over a week may be enough to make the birds quite uncertain, hesitation characterizing their attitude toward each other (the first objective indication of the weakening of recognition). After a separation of a fortnight or three weeks, birds usually showed no signs of recognition of other birds of the same species.

When combs were surgically removed (Guhl, 1945) from the hens, they were attacked as strangers upon return to their pens the second day after the operation. A control was isolated concurrently for the same period of time with each of the dubbed birds, and in each test was not attacked when it simultaneously rejoined its flock with the operated penmate. There appeared to be a limit to the number of individuals each can remember, as the members of large flocks seemed to find it more difficult to become well acquainted (Guhl, 1953). In a flock of 100 hens, back-pecks

were not uncommon and occasional brief fights occurred. There was some evidence that memory may be of shorter duration among hens in large flocks. Memory and habit, therefore, tended to stabilize the peck order through social inertia. In agreement with these observations is the fact that the social order was more stable in small flocks of hens than in large groups.

It is known, from experimentation, that the hens are not aware of social ranks (Guhl, 1942). No indications have been found that there is any leadership associated with high rank. Apparently the peck-order is not an end in itself, but serves as a social pattern by means of which these aggressive animals may learn to give and take and consequently may be able to live as a flock (Guhl and Allee, 1944). The significance of this social order organization has two major aspects: (1) May high social rank be associated with survival values from the viewpoint of the individuals? (2) Does an organized flock display any group advantages as compared with an unorganized or less-integrated group?

It has been shown by Masure and Allee (1934) and Collias (1944) that birds ranking high in the social order had precedence to food, and displayed greater freedom of the pen. Hens from the upper half of the social organization laid more eggs than their less aggressive penmates (Sanctuary, 1932).

Sanctuary (1932) experimented with the shifting of hens from pen to pen. He found that when all the birds placed into an empty pen were strangers to each other, only a few went out of

production. When the hens which were moved into a pen of established hens outnumbered the residents, only about one-fourth entered a pause; but the introduction of a few birds into an established pen resulted in a cessation of laying by nearly all of the outnumbered newcomers. He concluded: "The nearer the condition approaches that of one bird entering an established pen as a stranger, the larger the percentage of birds so introduced that will be thrown out of production."

Guhl and Allee (1944) demonstrated the value of social organization to the flock as a whole. The scheme was to contrast an organized group to one which lacked organization values. In making the tests, the birds were arranged at random. "Three flocks of seven each were allowed to establish and maintain a peck order. In the fourth flock, the longest resident was replaced daily from a group of isolated hens." After twenty-one days of isolation, the alternates met former flockmates as strangers and this caused the peck order to be in a continual state of flux. The control birds pecked each other less and consumed more feed than did the experimental birds; that is, after the initial period when they established their own social order. Controls maintained body weight while the experimentals showed a fairly consistent loss. Controls laid more eggs than the alternated birds.

According to Sanctuary (1932), there was no marked difference in egg production by different individuals when all hens in the flock were relative strangers; but when a strange hen or hens

were introduced into a flock of acquainted hens, the newcomers showed a reduced rate of egg-laying and some even ceased to lay for the time being. Sanctuary also has evidence that hens low in the social order may not realize their full potentiality in egg production.

METHODS AND MATERIALS

This study is actually a continuation of the experiment conducted by Sanctuary (1932); however, one of the major differences was the number of chickens that were used in the experiments. Sanctuary used fewer birds. In this experiment, four groups of fifty pullets each were used, making a total of two hundred.

One of the objects of this experiment was to see the effects that these shifts had on the amount of feed consumed, and how this in turn was related to egg production. Sanctuary, in his experiment, did not consider feed consumed, nor the relationship between this and egg production.

The effects of these shifts on body weight was another factor considered. This was important when considering the relationship in the amount of feed consumed to the weights of the birds at the termination of the experiment; that is, to see if the birds used the feed to maintain body weight and egg production, or only body weight. If used only to maintain body weight, this would prove to be an effect of the shifting.

A different strain of birds was used in this experiment from those used by Sanctuary. During this more recent experiment

only one breed and one strain was used, whereas Sanctuary used many breeds and strains while conducting his study.

Two hundred White Leghorn pullets reared on the Kansas State College Poultry Farm were randomized into four lots of fifty each. They were housed on October 8, 1953. Collection of data began October 16, 1953, allowing eight days as a period of adjustment. During this time the birds became acquainted with each other. The experiment terminated May 28, 1954, or 32 weeks later. The birds were weighed at the beginning and at the end of the study.

Numbered and colored wing badges were put on each bird. A different color was used for each pen, and the numbers were from one to fifty in each group. Pen A had red badges; Pen B (control), white; Pen C, green; and Pen D, yellow. The inside measurement of each pen was 13.5 by 14 feet.

The original plan was to have four periods of eight weeks each, however, as the experiment progressed, the plan was changed so as to have six periods, not necessarily of the same length.

As can be seen in Table 1, the column entitled "weeks" refers to the number of weeks that the birds were together without being shifted. As can be seen, the first three periods were of eight weeks each, but the remaining periods were shorter and not of equal length. The last gives the dates for each period; for example, period two was from December 12, 1953 until February 5, 1954, inclusive.

Table 1. Beginning, length of, and final date for each period.

Period	Length of period	Dates
1	8 weeks	Oct. 16-Dec. 11, 1953
2	8 weeks	Dec. 12-Feb. 5, 1953
3	8 weeks	Feb. 6-April 2, 1954
4	2 weeks and 4 days	April 3-April 20, 1954
5	2 weeks and 6 days	April 21-May 10, 1954
6	2 weeks and 4 days	May 11-May 28, 1954

Five shifts were made during the 32 weeks of the experiment. Period one refers to the period of adjustment for the individual birds. During this first eight-week-period none of the pullets were shifted; all the birds at that time were strangers to each other, and peck-orders were being established in all four pens.

The shifting plan that was followed can be seen in Table 2. This table shows the six periods, indicating that the birds were shifted five times. No shifts were made in period one. This table shows the wing badge number and color of all the birds shifted throughout the entire study, and also into which experimental pen they were moved. No birds were moved either to or from the control pen, which was Pen B. Due to some deaths, the number of birds shifted varied from pen to pen. This table does not show the exact number of birds that were shifted each time, but the numbers 1-25 are listed in this manner for simplicity; therefore, flock composition is not exactly as shown in this table.

Table 2. Dates shifts were made, badge number and color on groups of birds shifted, are given under pen into which they were moved. The flock composition for each pen after each shift is also indicated for each period.

Periods	Date shifted	Pens D	Pens C	Pens B	Pens A
1 Adjustment period*	10/8 to 12/11	1-50 yellow**	1-50 green**	1-50 white**	1-50 red**
	12/11 to 2/5	26-50 yellow 1-25 red***	26-50 green 1-25 yellow***	1-50 white	26-50 red 1-25 green***
	2/5 to 4/2	26-50 yellow 1-25 green***	26-50 green 1-25 red***	1-50 white	26-50 red 1-25 yellow***
	4/2 to 4/20	1-25 green 26-50 red***	1-25 red 26-50 yellow***	1-50 white	1-25 yellow 26-50 green***
	4/20 to 5/10	26-50 red 1-25 yellow***	26-50 yellow 1-25 green***	1-50 white	26-50 green 1-25 red***
	5/10 to 5/28	26-50 red 1-25 red***	26-50 yellow 1-25 yellow***	1-50 white	26-50 green 1-25 green***

* Only period 1 was used as an adjustment period during which time no birds were shifted.

** Original composition of each group prior to the first shift.

*** Newcomers, birds that were shifted into the pen indicated.

The corrected figures for the total number of birds for the last period are: Pen A, 42; Pen B (control), 46; Pen C, 42; and Pen D, 41. As shown in Table 3, six chickens with red wing badges died during the experiment, ten with green badges, eight with yellow badges, and only four with white badges. The mortality totals for each pen during each period and also the grand total of mortality is shown in Table 3. Deaths appeared to be more or less at random whether considered by pen, period, or badge color.

On May 10 all the birds that were originally started together; that is, all three experimental pens ended up together. They were, however, in different pens.

Social behavior was observed after making each shift. There was much fighting for an hour or more between the permanent residents and the newcomers. Peck-orders were not determined, as this would have required more time than was available for one person. The formula for determining the number of pecking combinations, dominance relationships, is as follows: $\frac{n^2 - n}{2}$. According to this formula, a total number of 1,225 pecking combinations per flock would be the result. To work out the peck-order probably would have required over 20,000 observed pecks per pen; therefore, only a general observation of behavior was noted.

All the birds in all three experimental groups were moved at least one time, the result being that all the birds of one color wing badge ended up together.

Table 3. Mortality per pen, per period, showing number of birds and wing badge color of all the birds that died during the experiment.

Pen	Periods						Total
	1	2	3	4	5	6	
A	Red 1	Red 1 Green 2 3	Red 1 Yellow 2 3	Yellow 1	-	Yellow 2	10
B	White 2	White 2	-	-	-	-	4
C	Green 1	Green 2	Red 1	Green 1 Yellow 2 3	-	Green 2	9
D	-	-	Yellow 1 Green 1 2	Green 1 Red 1 2	-	Red 1	5
Total per period	4	7	6	6	-	5	28

A record of feed consumption was made until the last three weeks, at which time it was noted that there was excessive billing of the feed from the troughs. It was impossible to get an accurate figure because of this, so the feed weighings were terminated. Mash and grain were recorded separately, but were added together for total consumption. The feed was weighed once each week.

Egg records were kept throughout the entire study. Only marketable eggs were recorded; that is, soft-shell or broken eggs in the nests were not counted. A daily egg record was kept for each pen. Group records were kept so as to show variations when the birds were shifted, and also to enable the author to treat the data statistically.

RESULTS

Recent experiments have shown that when birds were mixed; that is, when strangers were introduced into a flock, extreme tension was shown. Social stress and tension were observed at the time of the introduction of the strangers into the pen, as shown in PLATE I.

In this study, the number of strange birds and the number of birds in the home flock were approximately equal. In all experimental pens the strangers at first collected in a group apart from the home flock; but when a strange bird appeared in their vicinity, almost all of the home flock adopted an aggressive attitude. When two or more home birds began to fight simultaneously

EXPLANATION OF PLATE I

Social stress and tension were observed after the introduction of strangers into the pen. Alertness and raising of the hackles were also observed. There was a tendency immediately after the shift, for the newcomers to go to a corner in an attempt to be secluded from the resident birds.

PLATE I

with a strange bird, it appeared that the home flock banded together against the strange bird; however, this was a false conclusion, as each of the native birds was fighting against her own enemy. On numerous occasions it was observed that when two birds had a violent antipathy toward a third inferior bird, both began to chase the third bird. At such times it appeared that these birds were behaving cooperatively. In reality, both birds had the same bird for an individual enemy and this caused the appearance of cooperative fighting. If one of these despots was absent, the other continued the battle.

The manner in which the strangers and the home flock reacted to each other was very interesting to the author, as well as to the assisting observers. The typical behavior observed in the three experimental pens when strangers were added was as follows: the strangers appeared to be the most aggressive and did the major part of the threatening; in some cases, because they were in unfamiliar quarters, the strange hens frequently darted about when pursued by the resident birds.

The original plan for the shifting of the birds that was to be followed was changed in the middle of the experiment. Eight-week-periods suggested complete adjustment. The original plan was to make three shifts, moving twenty-five or one-half of the birds each time. A different twenty-five birds would be moved at each shift. The period between the shift was to be eight weeks. As the experiment progressed, the time that the birds were together was reduced. This was done primarily to see if a

shorter period that the birds were together would have an effect on the results. Presumably, the birds would have less time to become well-integrated socially.

Egg Production

It may be observed from Fig. 1 that very little variation existed between the experimental pens and the control pen. Increases and decreases occurred at approximately the same periods. Egg production increased the first three weeks of the experiment, then decreased until the tenth week at which time an increase was taking place. There was a tremendous decline in egg production during the fifteenth to the seventeenth ten-day-periods (March 10 to March 20) of the experiment. This decrease was due to a respiratory disorder. As the birds recovered, egg production increased until this study was terminated.

Total egg production per pen for each period varied very slightly as shown in Table 4. The means for the experimental pens and the control pen can also be seen in that table.

Data summarized in Table 5 show that experimental pens A and D had a higher egg production of 5.72 per cent and 3.0 per cent respectively than the control pen. Experimental pen C had an average egg production of 1.19 per cent lower than the control pen. The "T" value obtained between the experimental pens and the control pen were as follows: A and B, 0.961; C and B, 0.19; and D and B, 0.474. These values were not statistically significant ($P = 0.05$).

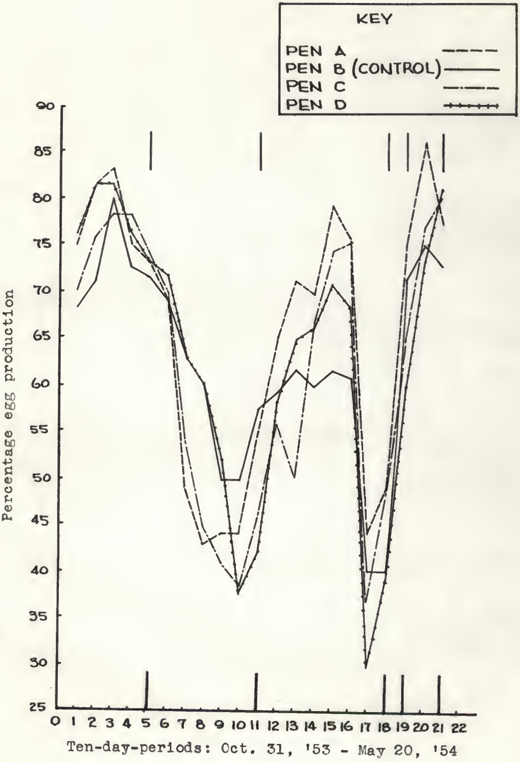

Fig. 1. Percentage egg production per pen per ten-day-period for experimental pens and the control pen.

Table 4. Egg production per pen per period, showing total number of eggs and the mean per period.

Pen	Periods											
	I		II		III		IV		V		VI	
	Total eggs	Mean	Total eggs	Mean	Total eggs	Mean	Total eggs	Mean	Total eggs	Mean	Total eggs	Mean
A	2109	37.66	1345	24.01	1716	30.64	331	18.39	665	33.25	558	33.82
B	1942	34.68	1547	27.67	1538	27.96	314	17.44	558	33.40	574	33.77
C	2016	36.00	1359	24.27	1658	30.15	321	17.83	604	30.20	566	34.75
D	2142	38.25	1533	27.38	1716	31.20	288	16.00	586	29.30	563	35.44

Table 5. Significance of the difference between the means in percentage production, based on number of eggs laid during each of 21 10-day summaries per pen. (Oct. 31, 1953 to May 20, 1954)

Comparison	N	Mean (%)	Standard deviation	Mean difference	T	P
Pen A	21	65.86	$\pm$ 14.8			Nonsig-
Pen B*	21	60.14	$\pm$ 16.8	5.72	0.9608	nificant
Pen C	21	58.95	$\pm$ 18.9			Nonsig-
Pen B*	21	60.14	$\pm$ 16.8	1.19	0.19	nificant
Pen D	21	63.14	$\pm$ 15.3			Nonsig-
Pen B*	21	60.14	$\pm$ 16.8	3.00	0.474	nificant

* Control group.

The effect on egg production by the shifting of approximately equal numbers of birds between the experimental pens and the control pen, was not harmful as can be seen in Fig. 1. There was some variation between the experimental pens and the control pen during the periods. At the termination of this study there was no significant difference shown between the experimental pens and the control pen.

Feed Consumption

The feed consumption in each of the four pens followed a very similar pattern as is shown in Fig. 2. The downward trends that appeared during weeks four, ten, and thirteen were attributed to variable weather conditions that were prevalent during those weeks. It was very cold, 20° F., during the fourth week, November 8, 1953; and during the later two, December 21,

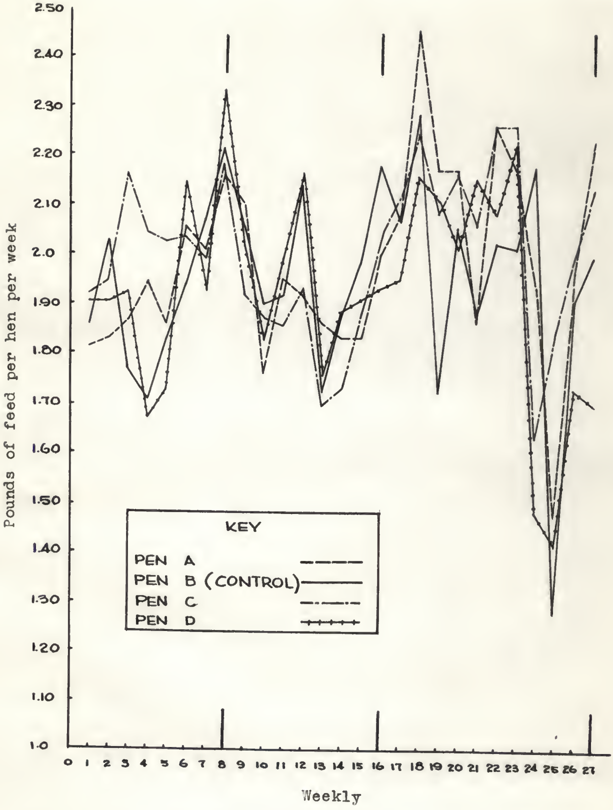

Fig. 2. Pounds of feed consumed per hen per week in the experimental pens and the control pen.

1953 and January 11, 1954, the temperature was 19° F. and 14° F., respectively.

The largest drop in feed consumption in all four pens occurred during the twenty-fifth week, April 1, 1954, and it was attributed to a respiratory disease.

Data summarized in Table 6 show the average weekly feed consumption for each pen. When strangers were introduced into a pen, social stress and tension in the form of fighting and avoidance were observed. Some individuals were unable to eat normally during this adjustment period. This would lead one to suspect variation in feed consumption after shifting. The "T" values obtained with regard to feed consumption between pens A and B was 1.179; between pens C and B, 1.376; and between pens D and C, 0.149. None of the differences between the mean of the control and each of the experimental pens was statistically significant (Table 6).

Table 6. Significance of the difference between the means of the pens in total feed consumed per hen per pen per week. Feed was weighed from Oct. 24, 1953 to April 26, 1954.

Comparison	N	Mean (pounds)	Standard deviation	Mean difference	T	P
Pen A	29	199.8965	$\pm$ 37.6			Nonsig-
Pen B*	29	193.6896	$\pm$ 39.1	6.2069	1.1993	nificant
Pen C	29	200.2413	$\pm$ 26.2			Nonsig-
Pen B*	29	193.6896	$\pm$ 39.1	6.5517	1.3758	nificant
Pen D	29	192.7586	$\pm$ 34.9			Nonsig-
Pen B*	29	193.6896	$\pm$ 39.1	0.9310	0.14896	nificant

* Control pen.

Some of the variation from week to week between the experimental pens and the control pen may have been due to inaccuracies in obtaining a measure of the feed consumed. At the termination of the study the difference between the total amount of feed consumed per pen between the experimental pens and the control pen was not significant. One can conclude from this that the shifting of equal or nearly equal numbers of birds has very little effect on the total amount of feed that was consumed per pen during this experiment. Some of the minor variations that occurred during the course of the experiment are shown in Fig. 2, and these may be attributed to the variable weather conditions that were mentioned earlier in this discussion.

Body Weight

The data summarized in Table 7 showed that in all pens the birds weighed more at the conclusion of the study than at the start.

Table 7. Significance of the difference between the means of the pens in gain in body weight. Birds were weighed at the beginning and the termination of the experiment.

Comparison	N	Mean (pounds)	Standard deviation	Mean difference	T	P
Pen A	43	0.65	$\pm$ 0.116			Nonsig-
Pen B*	45	0.70	$\pm$ 0.250	0.05	0.01	nificant
Pen C	41	0.65	$\pm$ 0.059			Nonsig-
Pen B*	45	0.70	$\pm$ 0.250	0.05	0.81	nificant
Pen D	43	0.50	$\pm$ 0.223			Less than
Pen B*	45	0.70	$\pm$ 0.250	0.20	3.4	0.01**

* Controls.

** A p-value of 0.05 or less indicates the difference between the means is statistically significant.

The birds in pen D showed the least gain in weight while the birds in pen B (control pen) showed the greatest increase in weight (0.70 lb.). The birds in pens A and C showed the same weight gain of 0.65 pound.

No significant differences were found between pen C and the control pen with regard to increase in body weight. A "T" value of 0.01 was obtained between pen A and the control pen, and a value of 0.84 was obtained between pen C and the control pen, B.

A significant "T" value (3.4) was obtained between pen D and the control pen B with regard to increase in body weight. Although statistically significant, this difference should not be taken too seriously, as the difference between experimental pens A, C, and D as well as between B, A, and C were not significantly different. Also there was a high coefficient of variation (44.6 per cent) in pen D, indicating that considerable variation existed in that pen which could have had some effect on the results. The difference between the means with regard to weight gained between experiment and control pens is shown in Table 7.

Gain in Body Weights

It may be concluded here, as with egg production and feed consumption, that the shifting plan that was followed throughout this study had little effect on the amount of gain in body weight between the experimental pens and the control pen. Although there was a statistically significant difference between experimental pen D and the control pen B, there were no other

significant differences between the other pens. Pen B, the control pen, showed the greatest mean increase in body weight.

It may be concluded from the above results, that the shifting of equal or nearly equal numbers of birds has very little, if any effect on the overall egg production, amount of feed consumed, and the gain in body weight. If birds must be shifted, a similar plan should be followed as was had throughout this study.

DISCUSSION

Differences in egg production between the experimental pens and the control pen did not prove to be statistically significant. The experimental pens that were being shifted laid as well as the control pen; however, it appeared that the drop in production of the control pen was not as sharp as the experimental pens when varied weather conditions occurred.

The differences between the means in the amount of feed consumed per hen per week among the experimental pens and the control pen were very slight. This indicated that the shifting of the birds had very little effect on food consumption. It must be remembered, however, that this experiment was conducted on a very conservative basis. The numbers of birds introduced (strangers) were approximately equal to the number in the pen (residents). The feed consumption pattern of the experimental pens and the control pen were relatively similar.

All the experimental pens and the control pen showed a gain in weight. A significant difference was found between one of the

three experimental pens and the control pen. This should not be considered seriously, because the differences between the three experimental pens as well as between these two and the controls were not statistically significant.

This experiment is in agreement with the finding of Sanctuary (1932) that the shifting of equal or nearly equal numbers of birds as far as egg production is concerned will not result in harmful effects. However, Sanctuary's conclusion that if unequal numbers of birds were shifted, social stress and tension would be increased to cause detrimental effects was not tested. Whereas Sanctuary used more than one breed and one strain, and in small numbers of each, the experiment reported here utilized only one strain of one breed, and a much more adequate number of individuals was used. Due to those major differences, the results found could be viewed from a more critical standpoint.

SUMMARY AND CONCLUSIONS

An experiment was conducted to study the effects of disruption caused by the shifting of equal numbers of birds on social behavior and egg production. The results obtained were:

1. Egg production was not affected by the shifting of the birds; when analyzed statistically, the difference between the means proved to be very slight.

2. The shifting of the birds seemed to have little or no effect on the amount of feed consumed between the experimental pens and the control pen.

3. An increase in body weight with the birds weighing more at the conclusion of the experiment was observed within each of the four pens.

4. A significant difference of 0.20 pounds existed in favor of the control pen over experimental pen D for the difference in body weight. However, no statistically significant differences existed with regard to this factor between the control pen and the other experimental pens.

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THE RELATIONSHIP OF DISRUPTIONS AMONG CHICKENS
IN SOCIAL BEHAVIOR AND EGG PRODUCTION

by

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The purpose of this experiment was to study some of the effects of shifting equal or nearly equal numbers of birds between pens, in social behavior and egg production.

Four groups of 50 birds each were used; three of which were used as experimentals and one as a control. All of the birds in each pen had colored wing badges with numbers on them. Each group's wing badges were numbered from one to fifty. One-half of each experimental group was shifted each time, that is, birds with badge numbers 1-25 were shifted one time, and numbers 26-50 were shifted the next time. The following results were obtained:

1. Differences in egg production between the experimental pens and the control pen did not prove to be statistically significant. Egg production was not affected by the shifting of equal or nearly equal numbers of birds. Differences between the means proved to be very slight.

2. The shifting plan that was followed in this experiment showed very little effect on the total amount of feed consumed by each group. Differences between the means of the three experimental pens and the control pen did not prove to be statistically significant.

3. All three experimental pens and the control pen showed a gain in body weight. A statistically significant mean difference of 0.20 pounds existed in favor of the control pen over one experimental pen for the difference in gain in body weight. However, the differences between the three experimental pens as well as between these two and the control, were not statistically

significant.

The above results indicate that the shifting of equal or nearly equal numbers of birds has very little, if any effect, on the over-all egg production, amount of feed consumed, and the gain in body weight. These results also show that if birds must be shifted, a similar shifting pattern should be followed as was carried out in this study.